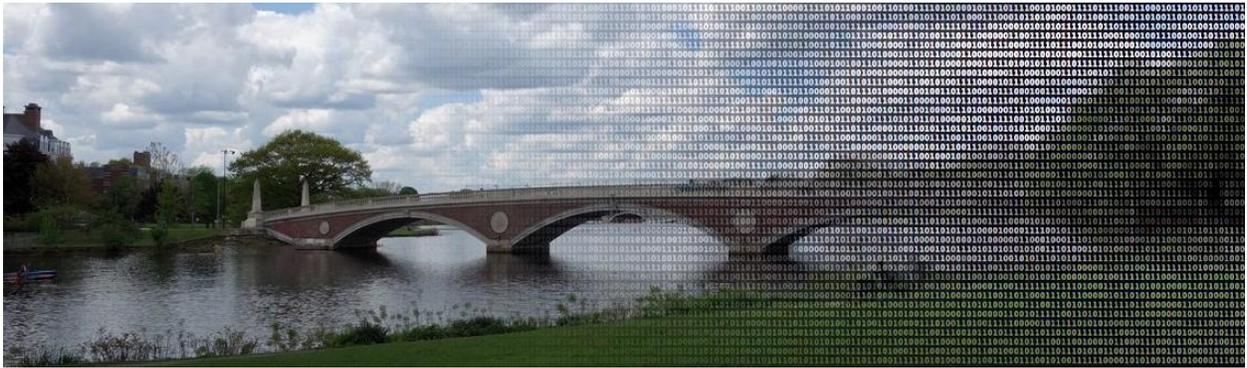


CITY OF CAMBRIDGE DATA ANALYTICS & OPEN DATA PROGRAM



STRATEGIC PLAN FY2023-FY2025

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Executive Summary

Data is an important tool for ensuring the wellbeing of Cambridge residents and stakeholders. Over the last seven years, Cambridge's Data Analytics & Open Data Program has collaborated with dozens of city departments to innovate, make delivery of city services more efficient, and improve transparency of operations. This strategic plan plots a three-year course for building on those successes.

The plan revolves around a simple but powerful mission: Help the City of Cambridge leverage data to improve transparency, efficiency, and innovation so that Cambridge becomes an even better place to live, visit, work, and do business. This mission touches on the activities of nearly every city department and staff-person. It encapsulates much of the work the Data Analytics & Open Data Program has already done to build out Cambridge's data supply, implement analytics to improve decision-making, bolster data governance processes, and improve public engagement with open data. It also served as a guiding star during the COVID-19 pandemic, when departments throughout the city collaborated with this program to leverage data to protect residents, staff, and local businesses.

To continue our journey over the next three fiscal years, our latest strategic plan suggests five program goals, each with multiple objectives:

- 1) *Ensure the use of modern product management practices for data product development.* By modernizing our approach to data product development, we can more quickly respond to user needs and create data driven insights that improve decision making.
- 2) *Develop robust data governance policies, tools, and practices.* By establishing a common set of processes and tools for managing data in Cambridge, we can maximize the usefulness of city data while also protecting data privacy.
- 3) *Collaborate with department staff to deploy advanced analytics more broadly.* By collaborating with a wider array of departments to leverage modern data science tactics for finding insights in large datasets, we can build a stronger foundation for leveraging cutting edge analytics tools to serve the public.
- 4) *Position the data program as a key partner for using data in high value city initiatives.* By bringing data analytics and open data tools to bear on Cambridge's most pressing issues, we can help departments and cross-functional teams identify new opportunities, optimize decision making, and better track progress on the city's top priorities.
- 5) *Create a more systematic set of data trainings and engagement practices.* By developing new trainings and tools for using data in daily operations, we will help prepare departments for a future in which all municipal staff use data-driven insights to help them achieve their mission.

These goals, described in greater detail in part 3 of this plan, are intended to work in concert as we continue pursuing the effective use of data and data-driven insights. Data and analytics are already changing every aspect of modern life. Municipal government is no exception. The City of Cambridge is well positioned to leverage data to improve the wellbeing of Cambridge's residents and stakeholders.

Introduction

The following strategic plan sets a course for Cambridge's Data Analytics & Open Data Program for fiscal years 2023 – 2025 (July 2022 through June 2025). Over the last seven years, this program has collaborated with dozens of city departments to innovate, make delivery of city services more efficient, and improve transparency of operations. Every meeting attended, every email sent, and every line of code written is aimed at helping Cambridge leverage data to better serve the public. As with any government program, these daily tasks can, over time, accumulate into truly impressive progress. This plan, however, does not represent a manual for running those daily operations. Instead, it is an outline for how we intend to grow and transform the program over the next several years.

The plan first reiterates the program's mission and vision, as well as the strategic framework we use to make long term decisions. These elements are described in Section 1 of the plan, and together they serve as a compass, pointing the direction in which Cambridge's staff should take the program. In Section 2, we take stock of how far we've come, detailing some of the Data Analytics & Open Data Program's major accomplishments over the last few years. Finally, in Section 3 we outline our roadmap for data analytics and open data during fiscal years 2023-2025. To create this final section, we compared our past progress against our strategic vision to identify major goals and objectives for the next three years.

When we published our last strategic plan in summer 2019, we had no idea that six months later the COVID-19 pandemic would turn the world upside down. We did know, however, that life is uncertain and that whatever plans we made would encounter unforeseen challenges and opportunities. COVID-19 was both. It forced us to postpone significant parts of that plan while simultaneously making the City's data program an integral part of Cambridge's pandemic response. Now, as then, we remain clear eyed that our plans will and must change over time. Some of the goals and objectives in this strategic plan may fall away, while new ones may find their way in. What will remain constant, though, is the Data Analytics & Open Data Program's dedication to leveraging data for the public good.

Part 1. Mission, Vision, and Strategic Framework

MISSION

The mission of the Data Analytics & Open Data Program continues to be: *Help the City of Cambridge leverage data to improve transparency, efficiency, and innovation so that Cambridge becomes an even better place to live, visit, work, and do business.*

VISION

The wellbeing of residents, visitors, workers, and organizations in Cambridge is improved through the use of data and analytics, which help make the delivery of city services more transparent, efficient, and innovative. Residents are better informed, engaged, and empowered because they have access to open data and data-driven insights. Data is governed wisely and strategically throughout the organization so that all datasets—whether open or internal—balance transparency and usability with privacy and security. City datasets are timely, accessible, usable, and understandable. Insights gleaned from data are clearly communicated, accurate, and actionable. City staff and leadership can effectively and ethically use data to track performance, investigate trends, and improve decision-making. The Data Analytics and Open Data Program not only provides City departments with analytical support, but also builds analytical capacity across City departments so that all municipal employees feel empowered to use data to achieve their mission.

STRATEGIC FRAMEWORK AND DATA SERVICES

When Cambridge's City Council passed the Open Data Ordinance in September of 2015, it instructed the City to view data as a tool for achieving greater transparency, efficiency, and innovation, while instructing staff to seek balance between making data available and protecting privacy. Though the program has grown in scope and scale since then, these same values remain its guiding principles. The 2020 strategic plan established the program's framework for running and growing Cambridge's Data Analytics & Open Data Program in accordance with these principles. The framework defines a successful Open Data Program as one that moves the City of Cambridge forward in five data service areas: data supply and automation, data analytics, data governance, user outreach and community engagement, and internal capacity building. See Figure 1.

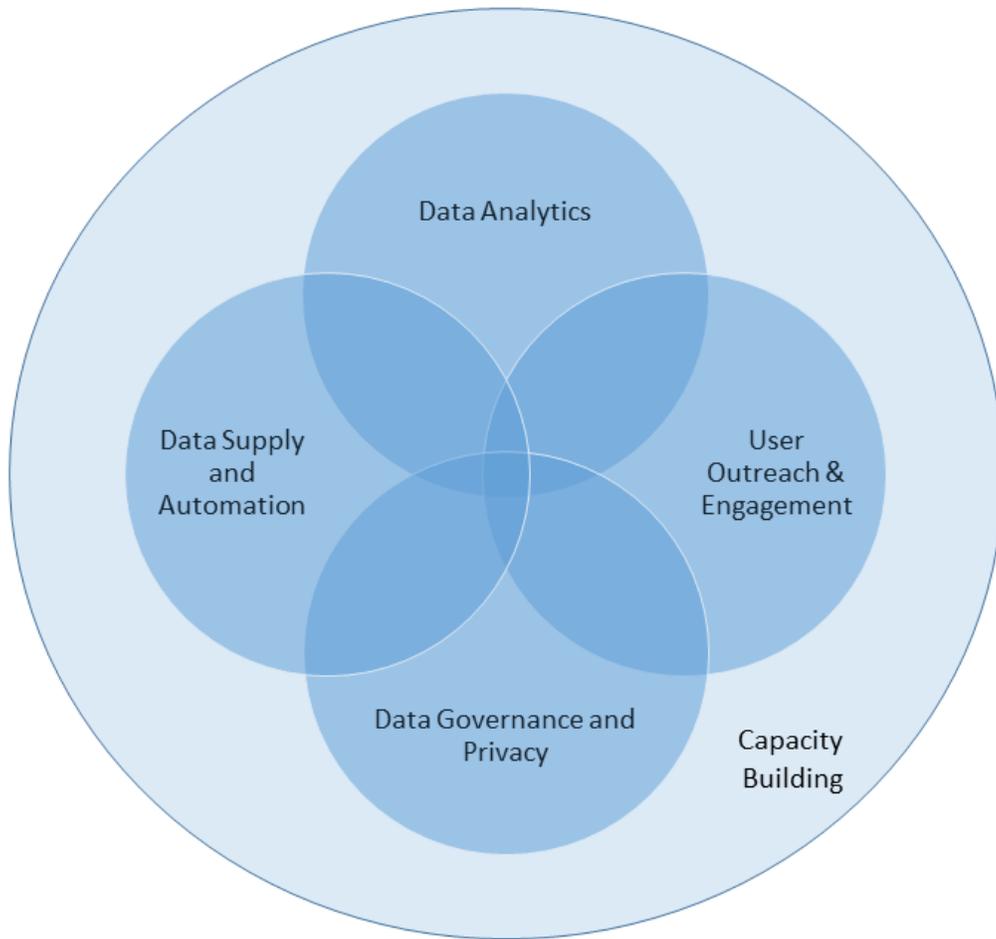


Figure 1: Framework underlying Cambridge's open data and data analytics work

Data supply and automation are efforts to share high quality data among departments and with the public. This fosters transparency and improves decision-making. Automation cuts the cost of supplying data while simultaneously improving data quality, thus increasing the net value of data.

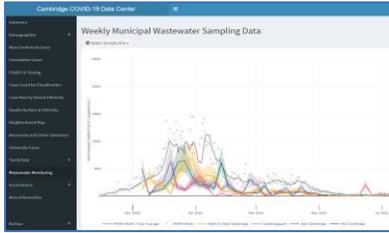
Data analytics are techniques and technologies for shaping data into insights that help improve decision-making and make delivery of city services more efficient.

User outreach and community engagement are activities for marketing open data to the public and for empowering external stakeholders to participate in the innovation process. Outreach has multiple value propositions: transparency, economic development, civic engagement, and public-private partnership.

Data governance maximizes data's value while minimizing risks to privacy. Good data governance ensures that the correct data reaches the correct audience at the correct time in the correct format.

Capacity building constitutes efforts to spread data skills throughout all City departments. The Data Analytics and Open Data Program envisioned by this plan should be the tip of the spear, developing cutting edge tools and practices for data supply, analytics, community engagement, and data governance, while at the same time empowering departments to leverage data on their own.

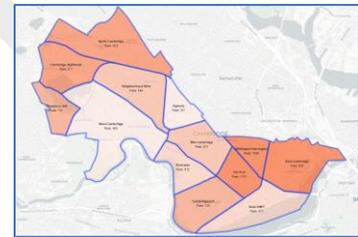
WHAT IT MEANT FOR CAMBRIDGE TO BE DATA DRIVEN IN FY20-22



The City Manager is updating the City Council on progress battling the pandemic. The City Manager, Chief Health Officer, and several City Councilors have Cambridge's COVID-19 Data Center open on their laptops or cell phone screens. The Data Center automatically refreshed earlier that evening with the latest daily case counts, vaccination rates, and testing data. The City Manager presents the top line metrics from the Data Center and comments on trends

shown in its maps and graphs. Councilors and residents refer to these data visualizations when posing questions and suggestions. Together, the administration, City Council, and residents develop a plan of action they hope will move the data in the right direction over the coming weeks and months.

Cambridge's lead epidemiologist feeds the latest COVID-19 case data through Cambridge's in-house geocoder. The tool's code maps text addresses – even misspelled addresses – and identifies the neighborhood and Census block they fall in. Now the epidemiologist knows which neighborhoods and demographics have been most impacted over the past two weeks. She calls her colleagues on the outreach team to begin planning targeted outreach campaigns and vaccination clinics.



Muted participants silently applaud over Zoom as the meeting hosts announce this year's Harvard Open Data Project datathon winners. The winning team used Assessing Department open data to analyze housing affordability across Cambridge. After the meeting, a few participants reach out to city staff with ideas about other data projects. One idea – a survey of local college students about COVID-19 vaccinations – will end up informing public health outreach efforts.

The last slice of pizza is up for grabs at the final 2019 Data Analysts Forum meeting. In the front of the room, an analyst presents her work on energy data visualization and solicits feedback from the group. "I'm the only data analyst in my department," she says, "so these meetings help me get feedback on my work at a technical level. What do you think I can improve?"



A manager in Cambridge's Public Works Department reads the July 2021 staff newsletter and sees that Cambridge has received gold certification for data driven decision making from a Bloomberg Philanthropies program called What Works Cities. Come to think of it, staff around the city have been using data more often nowadays. In fact, this manager just submitted his first open dataset last week. After closing the newsletter, he opens Cambridge's training calendar to see if he can sign up for the next data visualization training.



A resident member on the Vision Zero committee navigates to the open data portal for the first time. She needs data for a study about intersection safety in Cambridge. She had been worried it would be difficult to find, but now he sees that the portal homepage features a link to a Vision Zero data hub. Alongside it are links for other data hubs tailored for affordable housing, public health, and all sorts of other city priorities. She clicks the link and arrives at a collection of datasets, maps, and dashboards perfect for analyzing vehicle safety.

A housing analyst in the Community Development Department is helping to prepare data for an upcoming predictive analytics project related to affordable housing. They are using the City's new geocoding app to find the correct Census block for each residential property in the city. They are glad that the City made this into an app: apparently in the past users had to be able to code in order to use this tool. This is much easier – just a few buttons on a web interface. Still, the housing analyst makes a note on their to do list to check if that new Cambridge Data Academy they have heard so much about offers coding courses.



The owner of a local construction company uses one of the dashboards on the open data portal nearly every day. She has some suggestions about how to improve it and is glad the City provides her with an easily accessible feedback survey. Whenever she has filled out this survey in the past, she has received a timely response from Cambridge's open data staff, and the City has even used some of her suggestions to improve its data products.

Cambridge's new Data Governance Committee has just adjourned its latest quarterly meeting. At this meeting, members discussed strategies for making data collection and analysis more equitable across Cambridge. The committee has representatives from a variety of Cambridge departments. It helps improve data quality, privacy, and useability for Cambridge staff so that the City can make better, more data-driven decisions.



The housing analyst finally has time for some training. They navigate through Cambridge's internal Data Services Portal to the new Data Academy. There are many different course tracks in the academy to help students learn different ways to use data. The analyst finds a helpful course map which makes it clear exactly which series of online and in-person courses will help the analyst achieve their goal of learning basic coding for data analysis.

Part 2. Progress and Reflection

This section assesses our progress on the previous strategic plan and derives lessons learned for the next plan. Our FY2020 – FY2022 strategic plan suggested an ambitious set of goals for growing and transforming Cambridge’s Data Analytics & Open Data Program:

Invest in data analytics. Transform Cambridge’s Open Data Program into Cambridge’s Data Analytics & Open Data Program. Develop the skillsets, technical foundation, and business processes required to help Cambridge departments leverage data to make better decisions and serve the public more efficiently.

Prioritize high value open datasets. Focus staffing and resources on ensuring that stakeholders have access to the most useful and valuable open dataset.

Tell stories with data. Collaborate with subject matter experts throughout the City to breathe life into Cambridge’s open data using narrative and data visualization.

Involve the community in data-driven problem solving. Empower public stakeholders to use Cambridge’s open data to help solve key issues.

Build departmental capacity for leveraging data. Empower municipal staff to use data more effectively.

Prepare for the smart city and big data. Begin building a toolkit to help non-technical City staff and stakeholders leverage sensor data.

IMPACT OF THE COVID-19 PANDEMIC

Any attempt at strategic planning is an exercise in prediction, an attempt to adapt a program to better respond to future needs. When we developed our previous strategic plan in early 2019, we never could have predicted that the COVID-19 pandemic would dominate almost the entire implementation timeline for the FY2020-2022 plan (see figure x).



COVID-19 Pandemic

The pandemic was a stress test for Cambridge's Data Analytics & Open Data Program and many other City initiatives. All five aspects of the program’s strategic framework – data supply, data governance, analytics, community engagement, and capacity building – were tested and fortified by the crisis. More specifically, Cambridge departments collaborated with the Data Analytics & Open Data Program to:

- Supply, automate, and explain important new data sources to keep the public informed about the pandemic, public health response, and local economic response.
- Develop data governance and privacy rules, in collaboration with the Public Health Department, that kept the public informed while ensuring legal and ethical protection of public health data.
- Employ advanced analytics and data dashboarding techniques to plan, execute, and monitor the public health response, economic response, and municipal reopening.

- Collaborate with communications experts to engage the public in COVID-19 data.
- Build capacity through action by bringing together cross-functional teams to leverage data in service of Cambridge’s pandemic response.

As a result, this section’s reflection of FY20-22 attempts to account for progress on the original plan while also highlighting unanticipated program growth and transformation from the pandemic.

REFLECTIONS: INVESTING IN ANALYTICS

All Objectives Substantially Completed

Impact of COVID-19 on Planned Objectives: **Accelerated**

PROGRESS

Over the past several years, Cambridge has made great progress implementing a municipal data analytics program. Our completion of the objectives in our previous strategic plan has established a strong foundation for using data analytics to improve decision making and resource allocation across city government. Specifically, we:

- **Increased city staff’s understanding of and demand for data analytics** by educating senior leadership, departmental decision makers, and subject matter experts about how data analytics can drive better outcomes.
- **Streamlined implementation of data analytics projects** by creating several new business processes for identifying, planning, and managing data science projects.
- **Invested in technology platforms to communicate insights to staff and the public** using secure and engaging data dashboards and interactive web apps that empower users.
- **Piloted Cambridge’s initial advanced analytics projects**, which included a predictive analytics project to improve residential recycling rates and a probabilistic algorithm that enables city staff to transform lists of plain text addresses into analyzable map data.

COVID-19 PANDEMIC IMPACT

COVID-19 both accelerated this work and illuminated new opportunities for applying data analytics in Cambridge. [Our COVID-19 Data Center](#) was made possible through the technology investments, capacity building efforts, and organizational process development prescribed by the previous strategic plan. The same is true of other COVID-19 data initiatives such as [Cambridge’s COVID-19 twitter bot](#) and the implementation of Cambridge’s new geocoding tool to assist with public health analysis and outreach efforts. The pandemic tested and honed the Data Analytics & Open Data Program’s new approaches to analytics project management and helped us [create new pathways](#) for soliciting feedback from staff and residents. Finally, it demonstrated the importance of conducting analytics work in “cross functional teams” that bring together analytics staff, communications specialists, and subject matter experts to collaborate on strategic initiatives.

LESSONS LEARNED

- **Advocate for a more agile and user-centered project management style for most data analytics projects.** New data products should be published as soon as possible and then

improved over time in response to user feedback. The City didn't wait until its COVID-19 Data Center was perfect before publishing it. Instead, the City published that product as soon as it was accurate and useful, and then continued to improve it as new data became available. Most users appreciated this speedy and responsive implementation.

- **Strive for cross-functional teams when embarking on important data initiatives.** Data analytics is a team sport. It works best when analysts and coders collaborate with subject matter experts and communications specialists.
- **Seek user feedback for new data products.** We can create better data products faster by asking users to tell us how we can make beta products more accurate, useful, and informative.
- **Identify new ways to educate staff about how data analytics can help Cambridge achieve its strategic priorities.** New data education initiatives can help decision makers and leadership identify new opportunities for leveraging data analytics to serve residents.

REFLECTIONS: PRIORITIZING HIGH VALUE DATASETS

Most Objectives Substantially Completed

Impact of COVID-19 on Planned Objectives: **Accelerated**

PROGRESS

Cambridge made good progress focusing efforts on “high value” datasets to maximize open data’s value to residents. To achieve this goal, we:

- **Aligned the creation of new open datasets with Cambridge’s strategic priorities and the needs of other departments.** In addition to developing new open datasets to inform residents about COVID-19 trends, we improved collaboration with the Public Records Office and introduced new processes for increasing the likelihood that data analytics projects generate new open datasets.
- **Developed new tools and processes for measuring the value of open datasets and public-facing data products.** New insights about the popularity and usefulness of existing data products help us to both improve those products and develop new ones.
- **Implemented new practices for ensuring data quality for high value open datasets.** We introduced new data governance policies and new automated validation and alert technologies to ensure that high value open datasets update more reliably and contain more accurate data.

COVID-19

COVID-19 largely accelerated our work towards this goal. The pandemic resulted in a strong demand for [COVID-19 open datasets](#) as well as a demand for accompanying data visualizations and dashboards. Our work on the pandemic prompted adoption of automated alert and validation tools as well as the development of more sophisticated data dashboards. Additionally, the pandemic drove a significant increase in public requests for open data. However, the pandemic also left less time for staff to identify and develop high value datasets for non-pandemic priorities.

LESSONS LEARNED

- **Actively market the open data program to City staff as a tool public engagement.** Ongoing education and marketing efforts can help department staff and senior leadership spot high value opportunities to leverage the open data portal.
- **Continue seeking feedback from public stakeholders about open data needs.** The public remains the best and final judge of which datasets are truly “high value.” We should continue looking for ways to solicit feedback from residents.
- **Empower staff and residents to use and understand open data.** New educational offerings, improved data visualizations, and continued efforts to leverage open data as a tool for the City’s strategic priorities should help users across the technological spectrum engage more deeply with Cambridge’s open data.

REFLECTIONS: TELLING STORIES WITH DATA

Most Objectives Substantially Completed

Impact of COVID-19 on Planned Objectives: **Mixed**

PROGRESS

Cambridge made good progress on its goal of emphasizing data storytelling within its open data program. We implemented a new data storytelling module for our open data portal, used it to develop [our first data story](#), and continued looking for opportunities to publish [new data visualizations on our open data portal](#). Finally, we have made a conscious attempt to provide more nuanced contextual information in products like our data dashboards and our COVID-19 Data Center.

One objective we were not able to achieve was the continued and regular publication of data stories on our open data portal. We hope to make better progress on this objective in coming years by building on recent collaborations with communications specialists and department staff.

COVID-19

The COVID-19 pandemic both had accelerating and decelerating effects on this goal. The pandemic prompted the creation of the COVID-19 Data Center, which combines traditional data dashboarding with written narratives about the state and local management of public health data. The pandemic has also prompted the Data Analytics & Open Data Program to lend more support to city staff for ad-hoc data storytelling in social media and public meetings. Thus, the pandemic has helped us broaden our definition of data storytelling and has honed our ability to transform raw data into narratives that engage residents and inform decision making.

At the same time, the pandemic slowed progress on data storytelling by monopolizing staff time and attention. Data storytelling requires significant collaboration and effort from data analysts, subject matter experts, and communications specialists. Identifying messaging themes and crafting narratives are just as important as analysis for data storytelling. As the pandemic abates, we hope to reengage a variety of Cambridge staff in data storytelling.

LESSONS LEARNED

- **Data storytelling must be driven by department staff and communications specialists in addition to data analysts.** Data storytelling is equal parts data and story. Data analysts must organize data visualizations around a coherent narrative developed by non-data staff and informed by city priorities. A focus of this next strategic plan is building capacity among all city staff to recognize opportunities for collaborative data storytelling.
- **Data storytelling can take a variety of forms.** Our work in the pandemic showed us that data storytelling is not limited to a specific format or software. By broadening our definition of data storytelling to include formats like narrative-rich data dashboards and public meeting testimony, we empower city staff to recognize new opportunities for using data to inform residents.

REFLECTIONS: INVOLVING THE COMMUNITY IN DATA DRIVEN PROBLEM SOLVING

Some Objectives Substantially Completed

Impact of COVID-19 on Planned Objectives: **Decelerated**

PROGRESS

We made solid progress on our goal of better involving the community in data driven problem solving. Before the pandemic, we developed and piloted a public data visualization training course in partnership with CCTV. We also began new outreach efforts and partnerships with local community groups such as Code for Boston and universities groups such as the Harvard Open Data Project and Northeastern University's Boston Area Research Initiative. We created [an interactive open data user guide](#) to provide users with on-demand training for using Cambridge's open data portal to tackle city priorities. Finally, we began reorganizing the open data portal using more issue-oriented keywords, though this work will need to continue into the next strategic planning timeline.

Our program will also continue its work reorganizing the open data portal so that users can more easily find open datasets related to issues of interest. We will continue working with City leadership and communications specialists to create priority-specific data hubs on the open data portal homepage. Finally, more work is necessary for reaching out to new stakeholder groups and for investigating the extent to which partner outputs (e.g., data visualizations and apps created by the community) can be featured in a showcase on the open data portal homepage.

COVID-19

The COVID-19 pandemic mostly decelerated progress on this goal, at least in the short term. In person interactions with residents and local groups were curtailed by social distancing, and many local groups paused activities or disbanded during the pandemic. Staff in other departments, busy responding the pandemic, had less time to identify strategic priorities for data hubs. Much of this work will resume in the coming years.

The pandemic did, however, showcase what can be accomplished with data when City leadership, staff, and residents align in their desire to use data to help solve an important problem. Data Program staff used pandemic keywords to help stakeholders find relevant open data and worked with

communications staff to amplify awareness of pandemic data resources and products. As a result, the City saw unprecedented engagement with its open data resources.

The pandemic also paved the way for more online outreach to the public. Program staff conducted multiple online outreach and training sessions during the pandemic. We expect to continue this practice in the coming years.

LESSONS LEARNED

- **The public and community groups are eager to help Cambridge solve pressing issues.** Data Program staff, City leadership, and communications specialists must collaborate to highlight the most promising topics for civic data analysts to work on.
- **Embrace online outreach.** The pandemic demonstrated that online outreach and training sessions are an effective and engaging way to involve the community.

REFLECTIONS: BUILDING DEPARTMENTAL CAPACITY FOR LEVERAGING DATA

Some Objectives Substantially Completed

Impact of COVID-19 on Planned Objectives: **Mixed**

PROGRESS

We made solid progress on our goal of building departmental capacity for leveraging data. Most importantly, the Data Analytics & Open Data Program led a team of staff from departments across the city to achieve [silver-level certification in 2020 under Bloomberg's What Works Cities program](#) and then [advance to gold-level certification in 2021](#). This certification affirms that Cambridge is among the top performing cities nationwide for using data and evidence to drive city operations. Through its participation in the What Works Cities initiative, Cambridge created a variety of new tools, trainings, policies, and working groups to help departments use data more effectively. This work included developing new guidelines for program evaluation and randomized controlled trials, convening a working group for performance analytics, and drafting data quality standards.

Further progress is needed on objectives related to creating a Cambridge data academy, drafting data analysis hiring and procurement guidance for department leaders, and implementing more regular training and office hours schedules. These items will be an important focus of the coming years.

COVID-19

The COVID-19 pandemic had mixed effects on this goal. Social distancing precluded in-person trainings and office hours. It also consumed staff time both from department staff and Data Program staff, further reducing opportunities for trainings and other deliberate skill building activities. Yet the pandemic also forced teams throughout the City to be more deliberate about leveraging data for decision making and providing regular data updates to the public. Many of the open datasets and data dashboards prompted by the pandemic represent significant advances in the way City staff manage and analyze municipal data. The backdrop of COVID-19 makes it even more impressive that Cambridge was able to achieve silver and gold certification in Bloomberg's What Works Cities Program. The pandemic also acclimated staff to online trainings and paved the way for using virtual training tools to continue building organizational capacity in the future.

LESSONS LEARNED

- **Embrace online trainings.** The pandemic demonstrated that online training sessions are an effective and engaging way to reach department staff.
- **Design a broad but coherent menu of data training opportunities.** Cambridge should strive to provide city staff with opportunities to a variety of data skill trainings but should also identify coherent learning tracks so that prospective students don't become overwhelmed.

REFLECTIONS: PREPARING FOR THE SMART CITY

Few Objectives Substantially Completed

Impact of COVID-19 on Planned Objectives: **Decelerated**

PROGRESS

We still have much progress to make on our goal of preparing for the smart city, and some aspects of this goal will need to be rethought in the coming years. The Data Analytics & Open Data program supported and participated in the convening of a smart cities working group in early FY2020. However, a potential smart city playbook did not result from that convening, and we have yet to develop turnkey tools to help non-technical department staff analyze streaming data. In the coming years, we will attempt to integrate smart city considerations into our new planned goals.

COVID-19

The COVID-19 pandemic largely decelerated progress on smart city initiatives. Data staff, department staff, and City leadership were left with little time to work on large scale projects unrelated to the pandemic. However, the pandemic may have had a limited positive effect on smart city preparations in two areas. First, to help track infection rates and the pandemic's economic impact, the Data Analytics & Open Data Program developed automated tools to capture, analyze, and visualize sensor data. During the pandemic, sensors provided data about [SARS-COV2 viral loads in Cambridge wastewater](#) and traffic counts on certain key street segments throughout the city. Projects to manage and visualize this data helped prepare the City for a future of using sensor data streams to inform operational decisions. Second and more indirectly, the federal pandemic response included the passage of the American Rescue Plan Act of 2021 and US Infrastructure Investment and Jobs Act of 2021. These bills are likely to result in a nationwide increased investment in smart city infrastructure.

LESSONS LEARNED

- **Data is just one part of the smart city.** Data Analytics & Open Data Program staff should continue to prepare to help city staff use sensor data in decision making, but a holistic smart city initiative must also include staff with expertise in IT infrastructure, public works, mobility, finance, public administration, and many other non-data topics. The Data Analytics & Open Data Program looks forward to collaborating with this larger team to implement smart city projects.

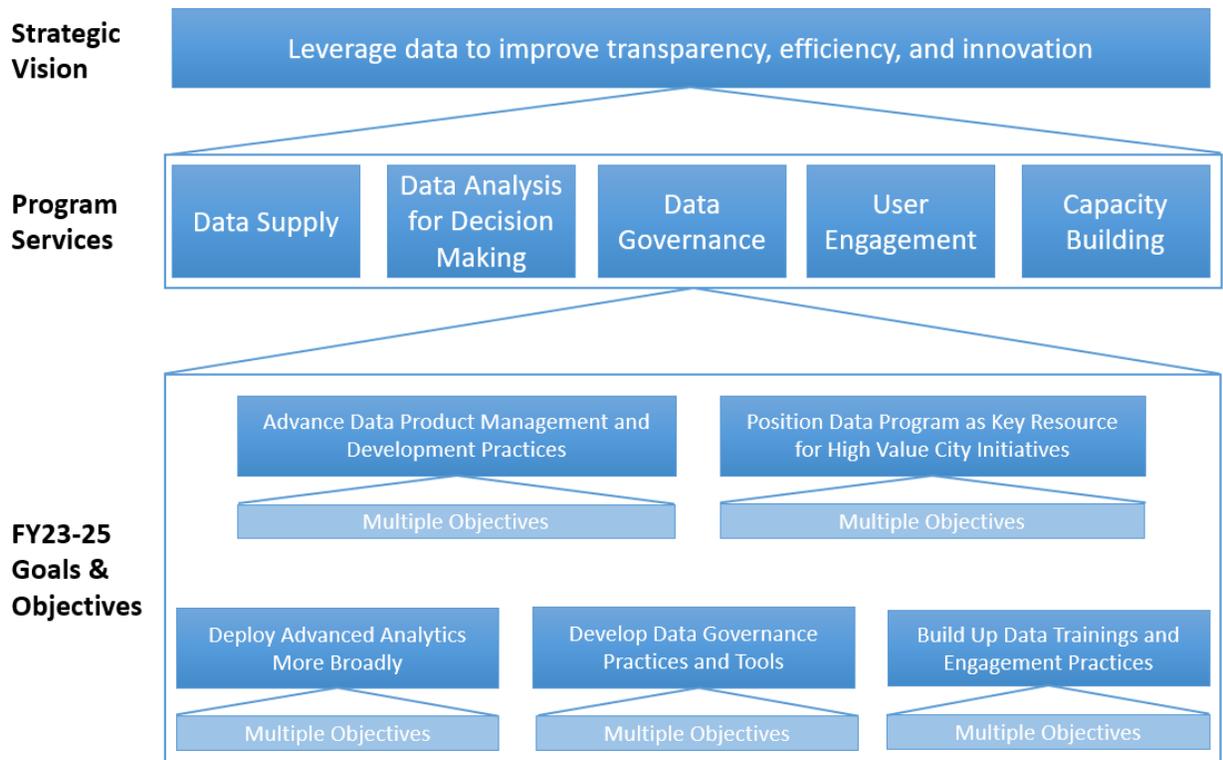
Part 3. Moving Forward: Goals and Objectives

The goals and objectives described in this section represent a three-year roadmap for growing and transforming Cambridge’s Data Program. Figure XX illustrates the hierarchy we used during the planning process to conceptualize the relationship between the program’s vision, strategic framework, goals, and objectives.

Each goal is a specific course of action that aligns with the mission, vision, and strategic framework discussed in Section 1 of this plan. Each goal also builds on the successes and opportunities outlined in the progress report from Section 2.

Goals comprise multiple objectives, which are discrete and well-defined projects intended to grow and transform the program. We designed these goals and objectives to position the Data Analytics & Open Data Program for three trends we anticipate for the coming years:

1. A desire among program customers for a data product development approach that is more agile and more responsive to user feedback.
2. Even greater demand for leveraging data and analytics to address Cambridge’s key priorities.
3. An increased emphasis on data governance, data quality, and algorithmic ethics.



1. ENSURE THE USE OF MODERN PRODUCT MANAGEMENT PRACTICES FOR DATA PRODUCT DEVELOPMENT.

Like other City initiatives, Cambridge’s Data Analytics & Open Data Program faced a trial by fire during the COVID-19 Pandemic. The rapid development and subsequent popularity of Cambridge’s COVID-19 Data Center demonstrated the opportunity for using more agile development processes for data products in Cambridge. Cambridge learned that even non-technical users want access to quantitative insights and learned the importance of transforming static analytical reports into interactive, self-service data products. The objectives below will help move the Data Analytics & Open Data Program toward a paradigm of continuous improvement and modernized product management.

Objective	Purpose and Description	Action and Deliverable	Status
1.1 Introduce new tactics for collecting, prioritizing, and implementing feedback and requirements from users and sponsors of city data products.	Cambridge’s 2020 Covid Data Center demonstrated that we could create valuable data products by gathering real user feedback and using an agile approach to continuously improve our product. Making these tactics our standard approach will help Cambridge create useful and usable data products.	Develop guidance resources that establish a flexible approach for incorporating user feedback into data product development. Guidelines should include both quantitative tactics (e.g., user analytics) and qualitative tactics (e.g., user profiles, interviews).	Planned
1.2 Leverage user testing to improve usability and accessibility of data products.	Having a trusted group of product testers to provide in-depth and on-demand feedback about new data products will help complement end-user feedback.	Develop a process for user testing and incorporating testing insights into data products.	Planned
1.3 Implement processes for tracking usership and success metrics for major data projects.	Quantitative success metrics will help complement qualitative user feedback, inform resource allocation decisions about existing data products, and inform the creation of new applications.	Collaborate with the web group to develop a menu of options for quantitative success metrics. Draft a template for tracking success of new projects.	Planned
1.4 Draft internal guidance about developing and using municipal analytics in cross functional teams and/or in emergency situations (e.g., lessons learned from covid data center work).	Cambridge’s 2020 Covid Data Center demonstrated that data product teams excel when members have diverse expertise. Going forward, Cambridge should strive to ensure that teams working on high value data products (particularly public facing products) comprise subject matter experts and communications specialists in addition to data analysts.	Develop guidance documentation with case studies and lessons learned on developing and using data and analytics in cross functional municipal teams.	Planned
1.5 Evaluate opportunities to use cloud technologies in data project pipelines.	Data analysis and product development is increasingly moving the cloud. Cambridge should strive to keep pace with this technical trend.	Identify opportunities to move local analytics pipelines to existing cloud services.	Planned

<p>1.6 Formalize use of version control and automated testing for data application development whenever possible.</p>	<p>We can continuously improve data product reliability and data quality by constantly striving to use best practice version control and testing approaches.</p>	<p>Draft a workflow template for formal version control and automated testing for new data applications.</p>	<p>Planned</p>
<p>1.7 Leverage monitoring and alert tools to ensure Cambridge data products are continuously working properly.</p>	<p>No software product can ever achieve 100% reliability, but by implementing best in class monitoring and alert tools we can ensure that users of Cambridge’s data products have the best possible usership experience.</p>	<p>Draft a workflow template for implementing monitoring and alert tools for Cambridge data products.</p>	<p>In Progress</p>
<p>1.8 Develop tactics for marketing new data products to internal and external audiences.</p>	<p>Software is only useful if it is used. A high value data product doesn’t necessarily need to have many users, but as many prospective users as possible should know about it. New approaches to marketing data products can help Cambridge reach new communities and solicit user feedback.</p>	<p>Draft a marketing plan or marketing templates for increasing awareness of new Cambridge data products.</p>	<p>Planned</p>

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2. DEVELOP ROBUST DATA GOVERNANCE POLICIES, TOOLS, AND PRACTICES.

Data governance means that means that high quality data is securely available to the correct stakeholders, in the correct format, at the correct time, for the correct use. As data is increasingly used to inform decision making, it becomes even more necessary to ensure that our data is accurate, current, and fair. The following objectives are intended to begin establishing a common set of processes and tools for managing data in Cambridge. Continuous improvements in data governance benefits the public by fortifying data protections and creating a high quality foundation for data sharing and analysis.

Objective	Purpose and Description	Action and Deliverable	Status
2.1 Release a data inventory identifying candidate datasets for Cambridge’s open data portal.	By providing staff and the public with a list of potential open datasets or data topics, we can get direct feedback from our customers about data priorities. This will help us continue to focus open data activities on high value open datasets.	Release a list of datasets or data topics that the City could offer as open data.	In Progress
2.2 Establish a data governance committee to advise on data governance procedures and tools.	Data governance is the development of policies and processes to ensure that data assets are formally managed throughout an organization. Data governance is a team activity: it requires engagement from a range of stakeholders. Cambridge’s data governance committee will ensure citywide input into data governance decisions.	Establish a data governance committee and hold the first four quarterly meetings.	In Progress
2.3 Develop data quality and data privacy guidelines and service standards to improve internal and open data.	Standards and guidelines for data quality and data privacy will help provide staff with the tools they need to make City data accurate, useful, and useable.	Release data service standards and guidelines for improving data quality and privacy in Data Program deliverables.	In Progress
2.4 Assess, and if appropriate pilot, an internal data sharing platform.	Data needlessly trapped within one department is as closed to the rest of the city staff as it is to residents. Open data shouldn’t be a binary concept: Just because a dataset is too sensitive to be posted online doesn’t automatically mean it should be viewable by only a single municipal employee. We need new technologies and business practices for ensuring that data from departments across the organization can be internally shared, combined, analyzed, and when appropriate, opened to the public.	Work with department-level analysts to identify specs for an internal data-sharing portal.	In Progress
2.5 Pilot approaches for quantitatively measuring privacy risk for publicly shared datasets.	Cambridge has operated at the forefront of assessing and addressing data privacy in open data activities. Going forward, it will be important to apply additional quantitative rigor to measure and mitigate data privacy concerns.	Develop tools and metrics to measure data privacy risk within and among open datasets.	In Progress

<p>2.6 Develop a process for expediting the sharing of data – including protected data – across departments and with trusted outside partners.</p>	<p>A documented and user-friendly process to expedite sharing of protected data internally and with trusted outside partners will help foster safer and more effective analytics work in Cambridge.</p>	<p>Develop a data sharing process and a set of data sharing MOU templates.</p>	<p>Planned</p>
<p>2.7 Implement a process to describe data collection methods for new datasets.</p>	<p>Narratives describing the process by which data is collected, compiled, and formatted can help staff improve data quality and help users understand a dataset’s limitations and context.</p>	<p>Add a data provenance metadata field for new datasets on the open data portal.</p>	<p>Planned</p>

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3. COLLABORATE WITH DEPARTMENT STAFF TO DEPLOY ADVANCED ANALYTICS MORE BROADLY.

Data analytics is the process of transforming datasets into useful insights that can improve decision-making and resource allocation. Cambridge's Data Analytics and Open Data Program helps the City realize this potential by working with departments and external stakeholders to create tools such as data dashboards and predictive algorithms. These tools will help city staff and residents make more data-driven decisions and reduce wasted resources. In FY20-22, Cambridge began implementing advanced projects in our public works and public health departments. The objectives below will help broaden these practices in other departments to reach additional staff and programs.

Objective	Purpose and Description	Action and Deliverable	Status
3.1 Develop trainings or workshops to help department staff identify new opportunities for machine learning, A/B tests, and other advanced analytics tech that could improve efficiency or innovation in city service delivery.	Advanced analytics are increasingly being used in Cambridge and in cities around the world. The most important and challenging part of these projects is often structuring questions in a way that can be answered via advanced analytics techniques. By educating policy makers about advanced analytics use cases, we may be able to help staff spot new opportunities.	Develop one or more trainings intended for introducing non-technical staff to advanced analytics concepts.	Planned
3.2 Complete at least one new predictive analytics project that leads to meaningful improvements in municipal work processes or service delivery.	Additional predictive analytics projects will continue justifying the value of data analytics for improving service delivery.	Complete one or more predictive analytics projects for Cambridge departments or programs.	Planned
3.3 Work with the purchasing department to draft educational materials for staff who need to evaluate software that boasts predictive analytics features.	Educating staff about the opportunities, risks, and realities of predictive analytics could help them more effectively evaluate new software procurements.	Draft a guidance document to help staff evaluate software with advanced analytics features.	Planned
3.4 Work with internal staff and community partners to expand guidelines for the ethical and equitable use of data analytics in Cambridge.	Data analytics techniques can be a powerful source of efficiency improvements but can also risk entrenching pre-existing inequities. Cambridge can help avoid these risks by educating staff about how to spot them when conducting advanced analytics projects or using analytical software.	Draft a guidance materials for helping staff assess ethics and equity issue when tackling data analytics projects.	In Progress

<p>3.5 Develop a framework for assessing dataset completeness, balance, and equity.</p>	<p>Datasets that underrepresent particular groups or geographic areas can lead to biased algorithms and decisions. Tools for evaluating datasets to understand these biases can help complement efforts to educate staff about how to ensure the ethical and equitable use of data analytics in Cambridge.</p>	<p>Develop a written framework and, ideally, a quantitative tool or tool set for understanding completeness, balance, and equity in municipal datasets.</p>	<p>In Progress</p>
<p>3.6 Accelerate development of “general purpose” data products and platforms that serve multiple user groups and which create new opportunities for data analysis.</p>	<p>Cambridge’s data analytics staff will strive to prioritize the creation of data products that can help multiple departments in order to increase the impact of this work. Examples of general-purpose data products might a custom geocoder or a set of tailorable dashboard templates.</p>	<p>Develop one or more data analytics tools that could serve multiple use cases and provide staff with access to the new tools via the data services portal.</p>	<p>In Progress</p>
<p>3.7 Accelerate the release of “general purpose” datasets that can be used for a variety of use case and used by a variety of departments and third party organizations.</p>	<p>Cambridge’s data analytics staff will strive to prioritize the creation of open datasets that can help multiple departments and community user groups in order to increase the impact of this work. Examples of general-purpose open datasets might be weather data or demographic data. These datasets might be sourced from third party providers such as the federal or state government APIs.</p>	<p>Post new general purpose open datasets to the open data portal.</p>	<p>In Progress</p>

4. POSITION THE DATA PROGRAM AS A KEY PARTNER FOR USING DATA IN HIGH VALUE CITY INITIATIVES.

In our previous strategic plan, we outlined the importance of focusing Cambridge’s open data efforts on “high value” open datasets – those data assets that would have the greatest impact on the organization and the community. The following objectives continue in that same direction by directing data analytics resources towards Cambridge’s most pressing issues.

Objective	Purpose and Description	Action and Deliverable	Status
4.1 Identify opportunities and tactics for using data to improve equity in Cambridge and for collaborating with community partners in these efforts.	Equity is a core focus of 21 st century governance in Cambridge and across the nation. Data analytics represents both a potential cause of and solution to equity issues. ITD’s Data Program will commit to using data wisely help Cambridge ensure an equitable community.	Draft a guidance document identifying best practices for ensuring equitable use of data and analytics across municipal operations and within Cambridge’s diversity, equity, and inclusion efforts. The document will accompany the program’s 2021 AI Risk Assessment Guide.	Planned
4.2 Develop new data tools and practices to help City staff use data and analytics to facilitate performance management programs within departments.	Performance measurement helps teams ensure that their activities are efficiently transforming City resources into positive outcomes for the community. Data analysis plays a key role in performance measurement, which in turn helps drive demand for additional data analysis services to help improve performance.	Develop data tools and meeting templates to facilitate performance management programs within departments.	In Progress
4.3 Highlight news stories and examples of data analytics usage throughout Cambridge and in other cities.	Learning to recognize opportunities for data-driven problem solving is a skill in itself. The Data Analytics and Open Data Program can help build this skill among subject matter experts by educating them about how their counterparts in other departments and cities are using data to deliver better services.	Create a space on the data services portal to post news stories about Cambridge success stories, local opportunities and nationwide trends for using data to further smart city initiatives.	Planned

<p>4.4 Educate departments about opportunities and tools for data storytelling.</p>	<p>Data storytelling is a powerful tool for using data to increase engagement and create positive change in the community. It cannot be driven solely by data analysts, but must instead be a collaborative effort among analysts, policy makers, and communications specialists. By educating policy makers and communications staff about data storytelling tools and techniques, Cambridge’s data program can empower these staff to spot new opportunities for data storytelling.</p>	<p>Develop new opportunities to collaborate with department communications managers on data storytelling.</p>	<p>In Progress</p>
<p>4.5 Create dataset tags and data hubs in the open data portal linking open datasets with key initiatives in order to foster public engagement in using data to help with key city initiatives.</p>	<p>Datasets on the portal should relate to City goals. Metadata fields such as keyword tags should link datasets to City goals whenever possible.</p>	<p>Design a space on the homepage for temporary data hubs, and create a process for staff to request a new data hub.</p>	<p>In Progress</p>
<p>4.6 Pilot a data services survey or series of surveys to better assess the needs of data program stakeholders and the impact of the Data Analytics & Open Data Program.</p>	<p>By periodically surveying data analysts and other users of stakeholders of the Data Analytics & Open Data Program, we can better understand the impact that the program’s data services are having on other City initiatives and overall wellbeing.</p>	<p>Design and pilot a survey or a set of surveys to understand data service customers and program impacts.</p>	<p>Planned</p>

5. CREATE A MORE SYSTEMATIC SET OF DATA TRAININGS AND ENGAGEMENT PRACTICES

Over the next decade, it will become increasingly important for every Cambridge department to be able to leverage data. Cambridge Data Analytics & Open Data Program could create lasting change across the municipal government by helping other departments learn new data skills, acquire new tools, and train great analysts. The following objectives represent a plan for strengthening our emphasis on training, collaboration, and capacity building in the coming years.

Objective	Purpose and Description	Action and Deliverable	Status
5.1 Create pathways to gather staff feedback about data tool and training needs.	The first step in designing good product offerings is assessing customer needs. By providing staff with new ways to ask for help, ITD's Data Program can efficiently tailor trainings, guidance, and outreach to staff needs.	Design new forms and surveys for gathering staff feedback and post to the new Data Services Portal.	In Progress
5.2 Create a second-generation data services portal.	An engaging and easy-to-navigate internal data services portal will help City staff more easily find tools, training, guidance, and opportunities for using data inform decisions.	Design and release a sharepoint site to replace and improve upon the existing Smartsheet data services portal.	In Progress
5.3 Develop a Cambridge Data Academy.	A flexible but coherent set of course offerings and online course recommendations covering all aspects of basic data analysis should be Cambridge's gold standard for training data analysts. Moreover, only a few other employers offer such a data training academy, so such an offering could be a powerful employee retention tool.	Develop and pilot a Cambridge data academy using a combination of in person and online offerings for staff.	Planned
5.4 Develop new Cambridge data training opportunities and documentation for the public users.	Training events and documentation is a good way to both upskill residents and engage the community in using Cambridge open data to help the City innovate. Previous public data visualization trainings were successful and well-attended. We hope to build on this foundation with additional training opportunities.	Post new user guide documentation on the open data portal and design at least one online data training event to be offered semi-annually for the public.	Planned
5.5 Draft guidance for departments that want to train or recruit their first data analyst.	One of the best ways the Data Analytics and Open Data Program can build analytical capacity across the City is to help departments invest in analyst staff. The Data Analytics and Open Data Program should offer support to departments who want to build their own staff capacity for data analysis work.	Draft a "So You Need a Data Analyst" guide for department managers.	Planned

5.6 Develop online data office hour schedule for both staff and public users.	Data office hours are an informal way for department staff to bring data projects and issues to the attention of Data Analytics and Open Data Program staff. They should be offered on a regular schedule.	Release a schedule of Data Office Hours for both staff and public users.	Planned
5.7 Develop survey or interview tools to help departments or cross-functional teams evaluate their use of data to drive operations.	Teams throughout the City are seeking guidance in using data to drive decision making and operations. ITD's Data Analytics program can help these teams assess the extent to which they are already using best practices and identify opportunities for growth.	Develop a customizable survey or interview guide to help departments evaluate their data driven decision making capacity.	In Progress
5.8 Create a guidance for departments looking to use data visualization products.	ITD's Data Program supports sophisticated data visualization tools such as PowerBI and R-Shiny. However, department staff may sometimes need lighter tools for simple visualization tasks. Staff could benefit from guidance on what products to use, when to use them, and what can and can't be supported by ITD's data program.	Compile a list of suggested data visualization options and post it to the new Data Services Portal.	Planned
5.9 Create a guidance for departments looking create and deploy surveys.	Departments throughout the City are increasingly using survey tools to better understand customer needs and program impacts. More education is necessary to help staff understand survey best practices, available tools, and when to turn to outside experts.	Develop survey guidance documentation and trainings to help staff more skillfully use survey tools.	In Progress